

HIGHLIGHTS from SLEEP

The Treatment of Early-Morning Awakening Insomnia With 2 Evenings of Bright Light

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Study Objectives: To assess the effectiveness of brief bright-light therapy for the treatment of early-morning awakening insomnia.

Participants: Twenty-four healthy adults with early-morning awakening insomnia were assigned to either the bright-light condition (2,500-lux white light) or the control (dim red light) condition.

Measurements and Results: The circadian phase of rectal temperature and urinary melatonin rhythms were assessed with 26-hour constant routines before and after 2 evenings of light therapy. Sleep and daytime functioning were monitored using sleep diaries, activity monitors, and mood scales before light therapy and for 4 weeks during the follow-up period. While there were no significant circadian phase changes in the dim-light control group, the bright-light group had significant 2-hour phase delays of circadian temperature and melatonin rhythm. Compared to pretreatment measures, over the 4-week follow-up period, the bright-light group had a greater reduction of time awake after sleep

onset, showed a trend toward waking later, and had a greater increase of total sleep time. Participants in the bright-light condition also tended to report greater reductions of negative daytime symptoms, including significantly fewer days of feeling depressed at the 4-week follow-up, as compared with the control group.

Conclusion: Two evenings of bright-light exposure phase delayed the circadian rhythms of early-morning awakening insomniacs. It also improved diary and actigraphy sleep measures and improved some indexes of daytime functioning for up to 1 month after light exposure. The study suggests that a brief course of evening bright-light therapy can be an effective treatment for early-morning awakening insomniacs who have relatively phase advanced circadian rhythms.

Keywords: Early morning awakening insomnia, circadian rhythm, body temperature, melatonin, bright light

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Subjective Daytime Sleepiness: Dimensions and Correlates in the General Population

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Study Objectives: Discrepancies between several widely used assessment tools suggest that subjective daytime sleepiness is not a unitary phenomenon. Most research, however, has been based on patients. The aim of this study was to examine whether qualitatively different facets of subjective daytime sleepiness exist in the general population and to assess how different aspects of subjective sleepiness varied by age, sex, education status, body mass index, sleep debt, Stanford Sleepiness Scale, and objectively measured sleepiness (Multiple Sleep Latency Test).

Design: Cross-sectional study.

Setting and Participants: Population-based sample of 1562 women and 1351 men, mean age of 46.6 ± 7.9 years, including a subset of 145 participants who underwent an Multiple Sleep Latency Test.

Measurements: Self-reported sleepiness problems, Epworth Sleepiness Scale items, sleep habits, Multiple Sleep Latency Test, and Stanford Sleepiness Scale.

Results: Principal-axis factor analysis of 13 self-reported daytime-sleepiness measures yielded 3 factors, labeled *perceived daytime sleepiness* (Cronbach's α

$= 0.74$), *subjective sleep propensity in active situations* ($\alpha = 0.82$), and *subjective sleep propensity in passive situations* ($\alpha = 0.63$). The factor-based scores were all related to increased body mass index and lower education status, but the associations of scores for perceived and subjective propensity factors differed with sex, age, sleep debt, MSLT, and Stanford Sleepiness Scale. Worse perceived sleepiness factor-based score was significantly related to female sex, younger age, higher sleep debt, and worse Stanford Sleepiness Scale scores. Worse factor-based scores for subjective sleep propensity in both active and passive situations were significantly associated with male sex, older age, and worse Multiple Sleep Latency Test scores.

Conclusions: Findings from the present analysis on a general population sample support the hypothesis that subjective daytime sleepiness has multiple dimensions.

Keywords: Daytime sleepiness, sex, Epworth Sleepiness Scale, multiple sleep latency test, Stanford Sleepiness Scale, self-reported sleepiness problems

Citation: Kim H; Young T. Subjective daytime sleepiness: Dimensions and correlates in the general population. *SLEEP* 2005;28(5): 625-634.

Severity of Sleep-Disordered Breathing Improves Following Parturition

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Study Objectives: Changes in sleep-disordered breathing associated with late pregnancy have not previously been systematically investigated; however, a number of case reports indicate exacerbation of obstructive sleep apnea in late pregnancy, often in association with maternal hypertension. We aimed to compare the severity of sleep-disordered breathing and associated maternal blood-pressure responses in late pregnancy with the nonpregnant state.

Design: Case-controlled, longitudinal study of sleep-disordered breathing during late pregnancy and postpartum.

Study Patients: Ten women referred for suspected sleep-disordered breathing during the third trimester of pregnancy.

Interventions: None.

Measurements and Results: Full overnight polysomnography and continuous systemic blood pressure were measured during the third trimester of pregnancy and 3 months following delivery. Parameters of sleep-disordered breathing, including apnea hypopnea index and minimum overnight arterial oxyhemoglobin

saturation, were compared between antenatal and postnatal studies. An improvement in both apnea-hypopnea index and minimum arterial oxyhemoglobin saturation occurred consistently in all subjects postnatally. In non-rapid eye movement sleep, mean apnea-hypopnea index was reduced from 63 ± 15 per hour antenatally to 18 ± 4 per hour postnatally ($P = .03$), and in rapid eye movement sleep, from 64 ± 11 per hour to 22 ± 4 per hour ($P = .002$). Minimum arterial oxyhemoglobin saturation was increased from $86\% \pm 2\%$ antenatally to $91\% \pm 1\%$ postnatally ($P = .01$). Arterial blood-pressure responses to apnea peaked at 170 to 180 mm Hg antenatally, while they only peaked at 130 to 140 mm Hg postnatally.

Conclusion: This study indicates that late pregnancy may be associated with increased severity of and associated blood-pressure responses.

Keywords: Obstructive sleep apnea, pregnancy, blood pressure

Citation: Edwards N; Blyton D; Hennessy A et al. Severity of sleep-disordered breathing improves following parturition. *SLEEP* 2005;28(6): 737-741.

Autonomic Dysfunction in Children with Sleep-Disordered Breathing

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Study Objectives: To measure sympathetic responses in children with and without sleep-disordered breathing.

Design: Prospective, observational study.

Setting: Kosair Children's Hospital Sleep Medicine and Apnea Center.

Participants: Subjects were prospectively recruited from children undergoing overnight polysomnographic assessments and were retrospectively grouped according to the results of the polysomnogram. Sleep-disordered breathing was defined as an apnea-hypopnea index >5 and children were assigned to the control group if their apnea-hypopnea index was < 1 .

Intervention: N/A.

Measurements and Results: During quiet wakefulness, pulse arterial tonometry was used to assess changes in sympathetic activity following vital capacity sighs in 28 children with sleep-disordered breathing and 29 controls. Each child underwent a series of 3 sighs, and the average maximal pulse arterial tonometry signal attenuation was calculated. Further, a cold pressor test was conducted in a subset of 14 children with sleep-disordered breathing and 14 controls. The left hand was immersed in ice cold water for 30 seconds while right-hand pulse arte-

rial tonometry signal was continuously monitored during immersion and 20-minute recovery periods. Signal amplitude changes were expressed as percentage change from corresponding baseline.

Results: The magnitude of sympathetic discharge-induced attenuation of pulse arterial tonometry signal was significantly increased in children with sleep-disordered breathing during sigh maneuvers ($74.1\% \pm 10.7\%$ change compared with $59.2\% \pm 13.2\%$ change in controls; $P < .0001$) and the cold pressor test ($83.5\% \pm 7.3\%$ change compared with $74.1\% \pm 11.4\%$ change in controls; $P = .039$). Further, recovery kinetics in control children were faster than those of children with sleep-disordered breathing.

Conclusion: Children with sleep-disordered breathing have altered autonomic nervous system regulation as evidenced by increased sympathetic vascular reactivity during wakefulness.

Keywords: Sleep-disordered breathing, autonomic nervous system, peripheral arterial tonometry

Citation: O'Brien LM; Gozal D. Autonomic dysfunction in children with sleep-disordered breathing. *SLEEP* 2005;28(6): 747-752.

Sleep Patterns of Young Men and Women Enrolled at the United States Military Academy: Results from Year 1 of a 4-Year Longitudinal Study

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Study Objectives: Sleep patterns of young adults are different from those of other age groups. This study examined sleep patterns of cadets during their first year at the United States Military Academy.

Design: This paper presents initial results of a 4-year longitudinal investigation into sleep patterns of college-age men and women.

Setting: Data were collected at the United States Military Academy, a 4-year undergraduate institution that develops men and women in 4 areas: intellectual, physical, military, and moral-ethical.

Participants: Survey data were obtained from all members of the Class of 2007 (N=1300), who ranged in age from 17 to 22 years. A stratified sample (n = 80) was selected to wear wrist-activity monitors. An additional 40 members of the junior and senior classes participated in the summer portion of the study.

Measurements and Results: Sleep patterns prior to entering the United States Military Academy were compared with patterns during cadet basic training and fall and spring semesters. Actigraphy data were recorded on a sample of the

class (n = 80) for 50 days during cadet basic training and 30 days during fall and spring semesters. During cadet basic training, incoming cadets received 5 hours 40 minutes of sleep per night. During fall 2003 semester, these same cadets received 4 hours 50 minutes of sleep on school nights and 6 hours 32 minutes on weekends. Sleep received during spring 2004 semester was similar, with 5 hours 06 minutes on school nights and 6 hours 29 minutes on weekends.

Conclusions: This first year of baseline data collection describes cadet sleep patterns and sets the stage to assess the effectiveness of follow-on interventions.

Keywords: Sleep deprivation, actigraphy, adolescent sleep patterns

Citation: Miller NL; Shattuck LG. Sleep patterns of young men and women enrolled at the United States Military Academy: Results from year 1 of a 4-Year longitudinal study. *SLEEP* 2005;28(7): 837-841.

Restless Legs Syndrome, Periodic Limb Movements in Sleep, and Depression

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Study Objectives: To review the literature on restless legs syndrome (RLS), periodic limb movements in sleep, and depression.

Design: Literature review.

Setting, Participants, and Interventions: N/A.

Measurements and Results: We conducted a comprehensive review of the literature searching for publications that included data on depression or antidepressants and RLS or periodic limb movements in sleep. Sixty-two relevant literature references were found and reviewed. Four population-based studies and 9 clinical studies reported significantly higher rates of depression symptoms in individuals with RLS than in controls. Conversely, the prevalence of RLS in patients presenting with depression was reported as elevated in 2 studies. Conflicting data were found regarding the effect of antidepressants on the sensory

symptoms of RLS. In contrast, several studies have found that selective serotonin reuptake inhibitor antidepressant use is associated with increased periodic limb movements in sleep.

Conclusions: Depression symptoms are common in adults with RLS. However, the relationship appears complex, with overlap between RLS- and depression-related symptoms confounding the issue. Given what is known at this time, we propose a specific treatment approach to patients with RLS and depression symptoms.

Keywords: Restless legs syndrome, periodic limb movements in sleep, periodic limb movement disorder, sleep disorder, depression, fatigue, antidepressants

Citation: Picchietti D; Winkelman JW. Restless Legs Syndrome, Periodic limb movements in sleep, and depression. *SLEEP* 2005;28(7): 891-898.